

**CLAIMS**

1. A multi-view display (49) configured to display two or more views directed to two or more respective viewing zones (23, 24), comprising:

5 a display panel (14), comprising a plurality of imaging units (32), and a plurality of colour filters (19a, 19b, 19c, 19d), wherein each of said colour filters is associated with one of said imaging units, the colour filters being arranged according to a first pitch and in a first sequence of colours; and

10 a barrier (20) including a plurality of colour portions (20a, 20b, 20c) comprising colour filter material, the colour portions being arranged according to a second pitch that is substantially equal to twice the first pitch and in a second sequence of colours that corresponds to the first sequence of colours when reversed in order,

15 wherein the barrier is positioned so that light exits the display panel after passing through one of the colour portions and one of said colour filters and the colour portions of the barrier are configured to cooperate with the colour filters to selectively direct said light passing to the first and second viewing zones.

20 2. A multi-view display (49) according to claim 1, arranged so that said light passes through one of said colour filters (19a) before passing through said one colour portion (20a).

25 3. A multi-view display (49) according to claim 1, arranged so that said light passes through said one colour portion (20a) before passing through one of said colour filters (19a).

30 4. A multi-view display (49) according to claim 3, wherein the colour filter material of the colour portions (20a, 20b, 20c) is a cholesteric filter material.

5. A multi-view display (49) according to any one of the preceding claims, comprising a light source (15) arranged to illuminate the imaging units (32) of the display panel (14).

5 6. A multi-view display (49) according to any one of the preceding claims, wherein barrier (20) is spaced from the colour filters (19a, 19b, 19c) by a separation interval that is less than  $p/0.0781$ , where  $p$  is the first pitch.

7. A multi-view display (49) according to any one of the preceding  
10 claims, wherein the colour portions (20a, 20b, 20c) of said barrier (20) are separated from one another by a black matrix (21).

8. A multi-view display (49) according to claim 7, wherein the  
15 plurality of colour filters (19a, 19b, 19c) are separated from one another by a black matrix.

9. A multi-view display (49) according to claim 8, wherein the barrier  
(20) is spaced from the colour filters (19a, 19b, 19c) by a separation interval  
that is less than 0.35 mm.

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10. A multi-view display (56) according to any one of the preceding  
claims, wherein the colour portions (20a, 20b, 20c) of the barrier (20) and the  
colour filters (19a, 19b, 19c) are aligned so that the light exiting the display  
panel (14) produces viewing zones (23, 24) that are asymmetrically arranged.

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11. A multi-view display (49) according to any one of the preceding  
claims, wherein said light source (15) comprises a plurality of light emitting  
diodes, wherein at least two of said light emitting diodes are configured to emit  
light of first and second colours respectively.

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12. A multi-view display (49) according to any one of claims 1 to 4,  
wherein said imaging units (32) are light emissive devices.

13. A display system comprising:  
a multi-view display (49) according to any one of claims 1 to 12; and  
audio output means (55) arranged to output audio signals  
5 corresponding to the information displayed in one or more of said viewing  
zones (23, 24).

14. A multi-view display (49) according to any one of claims 1 to 12  
or a display system according to claim 13, arranged to display information in  
10 an automotive vehicle (53).

15. Use of a multi-view display (49) according to any one of claims 1  
to 12 or 14 or a display system according to claim 13 or 14 to display different  
information in different ones of said viewing zones (23, 24).

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16. A method of manufacturing a multi-view display (49) according to  
claim 2, comprising:

providing said plurality of colour portions (20a, 20b, 20c) on a light  
transmissive substrate (17);

20 placing a sheet (22) of light transmissive material over said plurality of  
colour portions; and

providing the plurality of colour filters (19a, 19b, 19c, 19d) of the display  
panel (14) on said sheet of light transmissive material.

25 17. A method of manufacturing a multi-view display (49) according to  
claim 3 or 4, comprising:

providing said plurality of colour portions (20a, 20b, 20c) on a light  
transmissive substrate (18);

30 placing a sheet (22a) of light transmissive material over said plurality of  
colour portions; and

providing means (16a) configured to control said imaging units (32) on  
said sheet of light transmissive material.

18. A multi-view display (49) comprising:  
a display panel (14), comprising a plurality of imaging units (32) configured with a first pitch;  
5 a light source (15) arranged to illuminate the display panel; and  
a lenticular screen (30) arranged to focus light emitted by the light source to create images of light lines at said plurality of imaging units, the lenticular screen comprising a plurality of lenses (30a, 30b, 30c) configured with a second pitch;  
10 wherein said second pitch is substantially equal to an integer multiple of said first pitch, so that said lenses (30a, 30b, 30c) create images on two of said imaging units (32a, 32f) that are spaced apart from one another and adjacent imaging units (32a, 32b) are illuminated by images created by different lenses (30a, 30b).
- 15 19. A multi-view display (49) according to claim 18, wherein the light source (35) is arranged to generate said light lines at a third pitch, the third pitch being substantially equal to said second pitch.
- 20 20. A multi-view display (49) according to claim 19, wherein the light source (35) is arranged to generate the light lines at positions aligned with boundaries between the lenses (30a, 30b, 30c).
21. A multi-view display (49) comprising:  
25 a display panel (14), comprising a plurality of imaging units (32) configured with a first pitch;  
a light source (15) arranged to generate a plurality of light lines at a plurality of positions arranged with a second pitch; and  
a lenticular screen (30) arranged to focus light emitted by the light  
30 source to create images of light lines at said plurality of imaging units, the lenticular screen comprising a plurality of lenses (30a, 30b, 30c) configured with a third pitch that is substantially equal to the second pitch and arranged so

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that boundaries between adjacent lenses (30a, 30b, 30c) are aligned with the positions at which the light lines are generated;

wherein said second pitch is substantially equal to an integer multiple of said first pitch, so that said lenses (30a, 30b, 30c) create images on two of  
5 said imaging units (32a, 32f) that are spaced apart from one another and adjacent imaging units (32a, 32b) are illuminated by images created by different lenses (30a, 30b).

22. A multi-view display (49) according to any one of claims 18 to 21,  
10 comprising a scatterer (36) arranged to scatter light output by the display panel (14).

23. A multi-view display (49) according to claim 22, said scatterer (36) is a controlled scatter having a predetermined scattering profile.

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24. A multi-view display (49) according to claim 22 or 23, wherein said scatterer (36) has a scattering surface comprising periodic structural features (39a, 39b).

25. A multi-view display (49) according claim 19, 20 or 21,  
20 comprising:

a switchable diffuser (40); and

mode switching means (41, 42) configured to switch said diffuser between a diffusive state and a light transmissive state;

25 wherein said diffuser is positioned between the light source (35) and imaging units (32) so that, when the diffuser is in its light transmissive state, the light lines are imaged at the imaging units (32) and, when the diffuser is in its diffusive state, the imaging units (32) are provided with substantially uniform illumination.

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26. A multi-view display (49) according to claim 25, wherein said mode switching means (41, 42) are configured to switch the diffuser (40) between said states by applying and removing an electric field thereto.

5        27. A display system comprising:  
a multi-view display (49) according to any one of claims 18 to 26; and  
audio output means (55) arranged to output audio signals  
corresponding to the information displayed in one or more of said viewing  
zones (23, 24).

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28. A display (49) according to any one of claims 18 to 26 or a display system according to claim 27, configured to display information in an automotive vehicle (53).

15        29. Use of a display (49) according to any one of claims 18 to 26 or 28 or a display system according to claim 27 or 28 to display different information in different ones of said viewing zones (23, 24).

20        30. A multi-view display (49) comprising:  
a display panel (14), comprising a first plurality of imaging units (32a) arranged to display a first view to a first viewing zone (23) and a plurality of second imaging units (32b) arranged to display a second view to a second viewing zone (24), said first imaging units and second imaging units being separated by a plurality of third imaging units (32c); and  
25        an illumination arrangement (15, 43, 35) configured to illuminate the display panel (14) with a plurality of light lines;  
the display being arranged such that said third imaging units are not used to display information when said first and second views are displayed.

30        31. A multi-view display (49) according to claim 30, wherein said third imaging units (32c) are switched off when said first and second views are displayed.

32. A multi-view display according to claim 30 or 31, wherein each of said first, second and third pluralities of imaging units (32a, 32b, 32c) are arranged in columns and form part of a two dimensional array of imaging units  
5 (32).

33. A multi-view display according to claim 32, wherein said plurality of first imaging units comprises imaging units (32) arranged in adjacent columns (32a, 32b) of the display panel (14).  
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34. A multi-view display according to claim 33, wherein said plurality of second imaging units comprises imaging units (32) arranged in adjacent columns (32c, 32d) of the display panel (14).

15 35. A multi-view display according to claim 32, wherein said first, second and third pluralities of imaging units (32a, 32b, 32c) are arranged as a periodic sequence of columns in said array.

36. A multi-view display according to any one of claims 32 to 35, wherein the display panel (14) comprises a plurality of colour filters (47) arranged as a two-dimensional array.  
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37. A multi-view display (49) according to any one of claims 32 to 35, wherein said display panel (14) comprises a plurality of colour filters (47) based on at least four primary colours.  
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38. A multi-view display (49) according to any one of claims 30 to 37, comprising:

a light source (15); and  
30 a barrier (43, 48) including a plurality of light transmissive portions (44) arranged at a given pitch, located between the light source and the display panel (14);

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and is arranged so that the display panel is illuminated by a plurality of light lines.

39. A multi-view display (49) according to any one of claims 30 to 37,  
5 comprising a barrier (48) including a plurality of light transmissive portions, to selectively admit light, said light transmissive portions being arranged at a first pitch, the barrier (48) being positioned so that light emerging from the imaging units (32) is incident thereon.

10 40. A multi-view display (49) according to claim 38, wherein said barrier (48) is a switchable device that can be switched between a selectively transmissive mode, in which the barrier selectively admits light, and a light transmissive mode, in which the barrier (48) is substantially light transmissive in order to provide uniform illumination for the display panel (14).

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41. A multi-view display (49) according to claim 38 or 39, wherein said barrier (48) is a switchable device that can be operated in a first mode, in which the light transmissive portions are arranged with the first pitch, and a second mode, in which the light transmissive portions are arranged with a  
20 second pitch.

42. A multi-view display (49) according to claim 40 or 41, wherein said barrier (48) is a liquid crystal cell.

25 43. A multi-view display (49) according to any one of claims 38 to 42, wherein said display panel (14) comprises a plurality of colour filters (47) and wherein said barrier (43, 48) and said plurality of colour filters are arranged in a non-parallel configuration.

30 44. A multi-view display (49) according to claim 38, wherein the illumination arrangement (15, 46) comprises a light source (15) arranged to



generate light lines and a lenticular screen (46) arranged to image the light lines within the display panel (14).

45. A multi-view display (56) according to any one of claims 30 to 44,  
5 wherein light transmissive portions of the barrier (43, 48) and said third  
imaging units (32c, 32f) are aligned so that the light output by display panel  
(14) creates the viewing zones (23, 24) in an asymmetrical arrangement.

46. A display system comprising:  
10 a multi-view display (49, 56) according to any one of claims 30 to 45;  
and  
audio output means (55) arranged to output audio signals  
corresponding to the information displayed in one or more of said viewing  
zones (23, 24).

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47. A multi-view display (49, 56) according to any one of claims 30 to  
45 or a display system according to claim 46, arranged to display information  
in an automotive vehicle (53).

20 48. Use of a multi-view display (49) according to any one of claims  
30 to 45 or 47 or a display system according to claim 47 to display different  
information in respective ones of said viewing zones (23, 24).